

Hypodermoclysis in the Care of Older Adults

An old solution for new problems?

SUMMARY

Subcutaneous infusion (hypodermoclysis) is a simple, safe, and effective technique used to administer fluids into the subcutaneous tissues. This technique is indicated for fluid replacement when there is a need for repetitive venipuncture, veins are inaccessible, or there is recurring infiltration at intravenous sites. It can be started and maintained for prolonged periods by health care professionals with minimal training. The main risk, infection at the infusion site, can be avoided by frequently alternating the site of the infusion.

RÉSUMÉ

L'hypodermoclyse (infusion sous-cutanée) est une technique simple, efficace et sécuritaire pour administrer des liquides dans les tissus sous-cutanés. Elle est indiquée pour administrer des liquides de remplacement lorsque les ponctions veineuses sont répétitives, que les veines sont inaccessibles et que les sites d'infusion intraveineuse se sont infiltrés. Avec une formation minimale, les professionnels de la santé peuvent installer et maintenir les infusions pendant de longues périodes de temps. Il est possible d'éviter l'infection, qui constitue le principal risque, en alternant fréquemment le site de l'infusion.

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HYPODERMOCLYSIS IS A TECHNIQUE used to provide fluids,¹⁻³ electrolytes,^{3,4} glucose,¹ or drugs⁵ subcutaneously when oral intake is inadequate.

This technique became possible after the discovery of hyaluronidase in 1928. This lytic enzyme breaks down hyaluronic acid and causes rapid diffusion of injected fluids by temporarily lysing the normal interstitial barrier, which consists mainly of hyaluronic acid.^{6,7} Hyaluronidase, the "spreading factor," is found naturally in the venom of many poisonous snakes, insects, and tissue extracts. It is also produced by human spermatozoa to enable the sperm to pass through the cervical mucus plug to the uterus and fallopian tube.⁸

Hypodermoclysis was used widely in clinical practice during the 1940s and 1950s until Gardner and Murphy⁹ introduced the scalp vein set for intravenous infusions in infants and children. Although this technique was largely replaced by intravenous infusion, it still has limited use in pediatrics,^{10,11} geriatrics,^{8,12,13} and palliative care.^{3,11}

Today hypodermoclysis is rarely used, and many young physicians are unfamiliar

with this technique. This article was written to stimulate interest in this largely forgotten procedure and to familiarize readers with this technique, which offers many potential advantages over intravenous therapy, particularly in the care of older adults.

Indications

Hypodermoclysis is not meant to replace intravenous administration where an acute precise direct line clearly is needed. The main indication for its use is when adequate oral intake is not feasible and circumstances make the establishment of an intravenous line difficult, impractical, or unnecessary. It offers a safe, reliable alternative for fluid replacement in nonacute situations (see sidebar¹⁵). It is particularly useful for dehydrated older adults who are refusing food and fluids.^{8,12}

Case study

An 86-year-old man with Alzheimer's disease was brought from the nursing home where he lived because he suddenly became unresponsive. He was admitted to hospital and treated for pneumonia with intravenous antibiotics.

Alzheimer's disease had been diagnosed 5 years previously, and the patient had experienced a progressive decline in cognitive function over that period. Before admission he had been mobile but required

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assistance with washing, dressing, and grooming. He had occasional episodes of urinary incontinence. At his last outpatient visit to the Geriatrics Outpatient Department, he scored 12 on a Standardized Mini-Mental State Examination.¹⁵ He recognized his wife and children but was unable to carry on a meaningful conversation.

Following admission he remained in a stupor and poorly responsive. The family requested comfort measures only, that is, no intravenous antibiotics, no tube feeding, and no resuscitation in the event of cardiac arrest. The antibiotics were discontinued, but he became dehydrated because he was unable to swallow or take in enough fluids to maintain hydration. An intravenous infusion was started, but the patient interfered with the intravenous line and pulled it out again and again. Eventually there were no accessible peripheral sites for phlebotomy or intravenous infusions.

Hypodermoclysis was commenced, and in this way it was possible to give at least 1 L of fluids daily to maintain hydration. The infusions were given at a rate of 75 mL/h at first, but later by bolus infusions of 500 mL every 12 hours. These boluses took about 1 hour to administer. The site of the subcutaneous infusions was changed every 48 hours or when there was any evidence of redness.

The patient remained in a stupor and bedridden for the next 2 weeks. When we attempted to discharge the patient to the nursing home, they were unable to take him back because they were unfamiliar with the technique of subcutaneous infusion.

The family gave up the patient's bed in the nursing home, and the patient stayed in the hospital. Two weeks later, he started eating and drinking again. At that time, when we attempted to return the patient to the nursing home, his bed had been occupied and we had to start the placement process again. It is now likely that the patient will spend at least 6 to 12 months in the hospital waiting for another nursing home bed.

Advantages

Hypodermoclysis has distinct technical advantages over intravenous infusion.^{1,16-18} In patients with collapsed, thrombosed, tiny, or fragile veins that rup-

ture with infiltration into subcutaneous tissues and that cause problems with access, hypodermoclysis may be used to circumvent the problems of the intravenous route. It avoids the need to try to keep intravenous infusions going long enough to provide fluids in these circumstances, and it also spares access sites. Hypodermoclysis may be maintained for weeks, while the duration of intravenous infusions is usually measured in hours.

Hypodermoclysis may be started and maintained by any staff member who is capable of performing subcutaneous injections and does not require a physician or intravenous team. It does not immobilize a limb and requires less nursing time to supervise than an intravenous infusion. The fluid can be safely stopped and started at any time by closing and opening the clamp on the clysis tubing, as there is no concern about thrombosis in the needle.

In the care of elderly patients with heart failure, hypodermoclysis has many advantages over intravenous infusions. It is less likely to cause overloading and precipitate failure in these circumstances. Overloading with hypodermoclysis is more likely to result in subcutaneous edema. Unlike intravenous infusion, heart failure is a rare complication, and subcutaneous accumulation can be reduced by administration through Y-shaped tubing or periodic gentle massage of the infusion sites.¹⁸

The greatest advantage of hypodermoclysis lies in the avoidance of hospitalization of dehydrated patients. It is not uncommon that the decision to hospitalize a patient from the nursing home is made because the patient cannot maintain an adequate oral intake and cannot be given intravenous fluids. Staff in nursing homes at present do not have the resources to set up or maintain intravenous infusions. Hypodermoclysis can prevent hospitalization in these circumstances. It can also permit earlier discharge of the patient from the hospital to the home if the only reason delaying discharge is the need for parenteral analgesia or fluids.

For an older adult, relocation from a nursing home to hospital can cause confusion and an acute deterioration in function; these problems can be avoided by using hypodermoclysis to treat that individual in more familiar surroundings.

PURPOSE

To provide fluid replacement subcutaneously to patients in whom oral and intravenous routes are not suitable options

EQUIPMENT

Hypodermoclysis solution

- Intravenous tubing
- 25-gauge butterfly infusion set
- IV pole
- Transparent dressings
- Alcohol and iodine swabs

Isotonic fluids with 150 U of hyaluronidase added to 1 L of solution. The enzyme hyaluronidase is used to facilitate the absorption and dispersion of fluid into the subcutaneous tissue.

Important precaution: Never use electrolyte-free hypotonic solutions, as this can lead to shock.

SET-UP

1. A physician is responsible for ordering and initiating hypodermoclysis therapy.
2. Explain procedure to patient.
3. Check solution and medications added.
4. Prepare infusion equipment (tubing, solution, etc) for intravenous therapy (*Figure 1*).
5. Cleanse site thoroughly with solution (eg, povidone-iodine 10%)(*Figure 2*). (Sites normally used are the lateral chest, abdomen, lateral, and anterior aspects of thighs and upper hips.)

6. Wipe povidone-iodine off using alcohol swabs.
7. Insert needle by grasping the skin between thumb and forefinger. Insert needle below lifted skin at approximately a 45° angle. The needle should move freely in this space (*Figure 3*).
8. Attach needle to IV tubing (*Figure 4*).
9. Secure with tape, as in intravenous therapy (*Figure 5*).
10. Secure tubing (*Figure 6*).
11. Run infusion at the prescribed rate.

Some physicians recommend 0.5 mL of hyaluronidase should be injected into the clysis site before the infusion.

FOLLOW-UP CARE

1. Avoid edema by watching for signs of fluid accumulation in tissues around injection site; change site if this occurs.
2. Observe for redness or irritation at the infusion site when hyaluronidase is used, as there is a possibility of allergic reactions.
3. Observe for signs of fluid volume overload due to rapid absorption of fluid when hyaluronidase is used.
4. Observe for signs of infection at injection site. Always use sterile technique when inserting or removing needle.
5. Watch for dislodgement of needle and disconnection of tubing.
6. If surrounding tissues show signs of inflammation, change site immediately. Observe as for IV site.

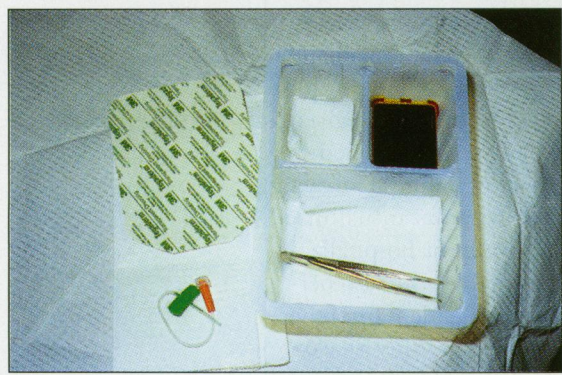


Figure 1

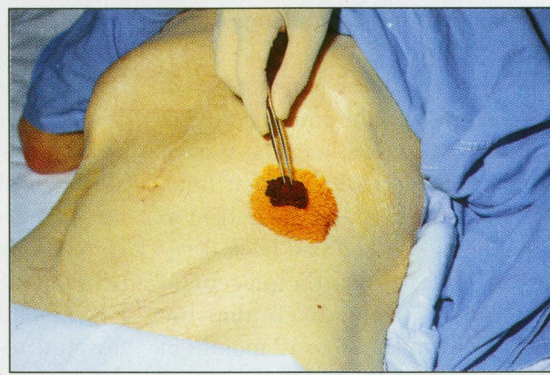


Figure 2

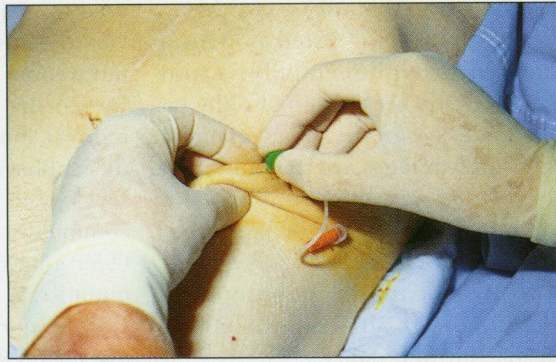


Figure 3

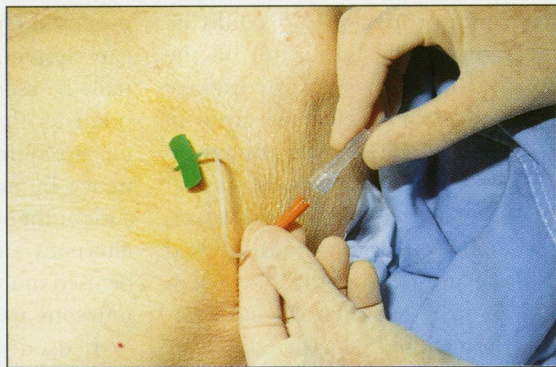


Figure 4

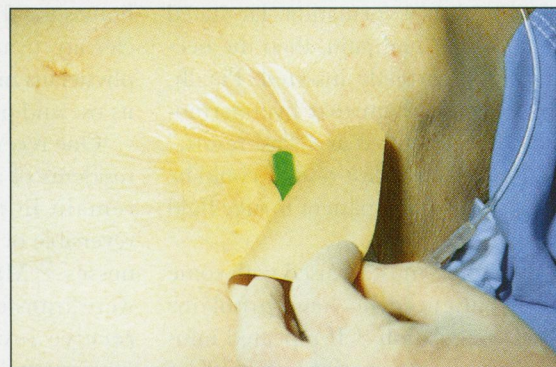


Figure 5



Figure 6

Disadvantages

Boylan and Marbach¹⁹ listed potential problems with hypodermoclysis and claimed that this technique should be used only as a last resort. They claimed the main disadvantages are the limitation on the volume of fluid that can be infused, possible puncture of large vessels, sloughing of tissues as a result of malabsorption or use of inappropriate fluids, infection with abscess formation at the infusion site, and pain.

Berger,¹ an advocate of hypodermoclysis who had extensive experience with this technique, claimed that these objections were inappropriate and could be easily overcome. The limitation on the amount of fluid was inappropriate because up to 3000 mL can be given in 24 hours, which is more than enough to provide for nutritional needs. He questioned the existence of large blood vessels in the subcutaneous tissues and advised that, if blood appears in the line when the needle is inserted, then the subcutaneous injection should be aborted.

In his 25 years of experience using this technique, Berger¹ had never observed sloughing as a result of insufficient fluid absorption or abscess formation. He stated that, if the patient had pain, then the needle had been incorrectly inserted. Finally, in response to the claim that hypodermoclysis should only be used as a "last resort," Berger claimed that a "last resort" could be defined as failure of the patient to take fluid by mouth.

This procedure must be used with some caution in patients who have problems with blood coagulation.¹⁷ If repeated infusions are given, the patient should be examined for residual edema before each new infusion is started. In patients with severe heart failure, infusions must be given slowly and should consist mainly of isotonic fluids. If the patient complains of pain, the infusion should be slowed and the infusion fluid checked. Hypodermoclysis is best avoided in cases of shock where absorption of fluid from the subcutaneous tissues is inadequate.²⁰

Discussion

Hypodermoclysis is a safe, simple, and largely forgotten technique that has distinct advantages over intravenous infusions in the care of some older adults. It can be

used to maintain parenteral hydration in a variety of settings where physicians or intravenous teams are not readily available. In Canada at present, there is a trend to redirect long-term care services and shift the emphasis from "over-reliance on facility services to the development of creative community based services"²¹ to caring for older adults in their own homes and communities.

Hypodermoclysis offers a simple, effective means of providing parenteral medications, electrolytes, fluids, and glucose to older adults. The time has come to review this underused technique in the context of proposed changes in the Canadian health care system. This technique could potentially be used in the home,²² nursing home, home for the aged, and chronic care hospital. It requires minimal set-up and maintenance by nurses who are licensed to give subcutaneous injections. It offers a safe alternative to intravenous infusion and can be used in many settings where intravenous infusions are impractical.

If used judiciously, hypodermoclysis could allow earlier discharge of the patient from hospital to the home or long-term care setting. However, if nursing homes, homes for the aged, and community agencies are to use this technique, then family physicians must become more familiar with its use and potential.

One recent study emphasized that many residents of a home for the aged wished to remain in the home if they developed reversible or irreversible life-threatening illnesses.²³ Many were afraid that, if they were transferred to hospital, they would receive invasive tests and treatments against their wishes. However, unless these homes have the ability to provide fluid parenterally, many of these patients are transferred to acute care hospitals because they become dehydrated.

If health care directives are to be implemented in long-term care institutions, then it will be necessary to develop palliative care services in these settings. Furthermore, with the resources that are saved from decreased admissions to the acute care institutions, it will become cost effective to increase the resources in the long-term care setting to use these creative and innovative techniques.

Hypodermoclysis is a procedure whose time has come for resurrection

and reevaluation. At a time when expensive new technologies are often overwhelming, it is refreshing that such an old and simple technique has so much to offer. ■

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